

# Rubidium Clock

## AR60A

### INDUSTRIAL/RUGGEDIZED RUBIDIUM ATOMIC FREQUENCY STANDARD

#### Key Features

<b>Output Frequency:</b>	10MHz (or 5MHZ)
<b>Low Aging:</b>	$5 \times 10^{-10}$ per year
<b>Temperature:</b>	-40°C to +77°C (Opt.)
<b>Supply Options:</b>	15VDC, 12VDC, 28VDC
<b>Power consumption:</b>	9W @ 15VDC steady state
<b>Fast Warm-up:</b>	5Min to $5 \times 10^{-10}$ (Opt.)
<b>Digital Frequency Control:</b>	$< 1 \times 10^{-12}$ steps over; $> 1 \times 10^{-6}$ range (Opt.)
<b>Holdover</b>	OCXO Hold Over
<b>High Reliability</b>	MTBF > 1,400,000 hrs.@ 25°C
<b>Extremely Small:</b>	77x77x39.6 mm

#### Description

AR60A is an extremely small, very high performance Atomic Rubidium Frequency Standard designed to operate reliably in demanding applications and harsh environment.

AR60A includes a high performance Oven Controlled Crystal Oscillator (OCXO) that is locked to the Rubidium Atomic Resonance using a sophisticated digital FLL (Frequency Lock Loop) thus maintaining its very high stability and accuracy.

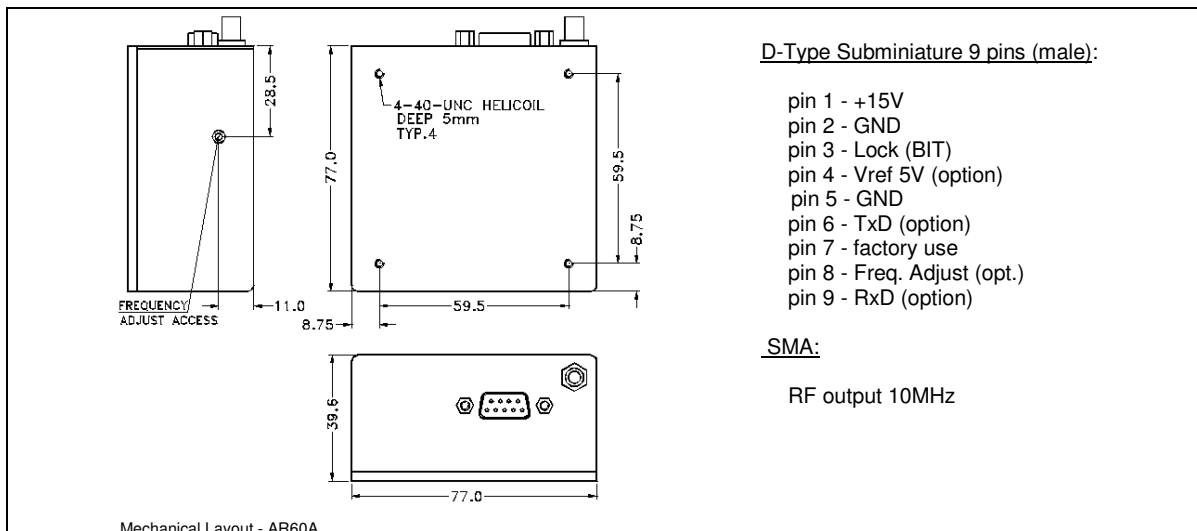
The unit contains a micro-processor which optimizes its performance vs. external disturbances.

(e.g. at a very high temperature or shock). In addition, a built-in synthesizer allows a very fine digital frequency control over a wide range (option).

The unit is a perfect replacement for larger and more expensive units available in the market today, as well as for high precision oscillators.

#### Applications

- ❖ Test Equipment
- ❖ Telecommunications
- ❖ Cellular Phone Base Stations
- ❖ Scientific Equipment
- ❖ Secure communication
- ❖ Mobile Radio
- ❖ Calibration
- ❖ TV Stations
- ❖ Internet and more.



Mechanical Layout - AR60A

AR60A DATA SHEET- REVISION: June 14, 2009

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE. THE BINDING SPECIFICATIONS ARE ONLY THOSE STATED IN OUR QUOTATION/PROPOSAL/CONTRACT. THIS PRODUCT IS COVERED BY THE FOLLOWING U.S. PATENTS: 6130583. OTHER PATENTS PENDING.

## SPECIFICATIONS

All specs are at room temperature, quiescent conditions, sea level ambient unless otherwise specified.

Parameter	Standard Version AR60A-00 (*)	Options (**)
<b>Output Frequency</b>	10MHz, sine wave, +(12±2) dBm / 50Ω	TTL, CMOS, 5MHz
<b>Stability:</b>		
<b>Long Term (Aging):</b>	<1 x 10 <sup>-9</sup> /year (after 3 months operation) <5 x 10 <sup>-10</sup> /year (2nd year)	<5 x 10 <sup>-10</sup> / year
<b>Short Term (Allan Dev.):</b>	<3 x 10 <sup>-11</sup> @ 1sec <3 x 10 <sup>-12</sup> @ 100sec	<1.5 x 10 <sup>-11</sup> @ 1sec <2 x 10 <sup>-12</sup> @ 100sec
<b>Phase Noise:</b> dBc / Hz	@ Frequency	Phase Noise
	10Hz	<- 95
	100Hz	<- 130
	1000Hz	<- 140
	10000Hz	<- 145
<b>Harmonics:</b>	<- 45 dBc	
<b>Spurious:</b>	<- 75 dBc at ± 1.5 MHz from carrier	<- 90 dB (10MHz ± 1MHz)
<b>Warm-up:</b>	4 min to lock 7.5 min to 5x10 <sup>-10</sup>	3.5min to lock 5 min to 5x10 <sup>-10</sup> (* ) At -40°C warm up time is longer
<b>Supply Voltage:</b>	15Vdc ±5%	a) 12V±4% b) 18Vdc to 36Vdc,
<b>Supply Current:</b>	Steady state: ~0.6A @ 15Vdc	Steady state: ~0.8A @ 12Vdc ~0.4A @ 28Vdc
	Warm-up (<6min): ~1.7 A @ 15Vdc	Warm-up (<6min.): ~1.9A @ 12Vdc ~1A @ 28Vdc
<b>Stability / Temperature:</b>	±3x10 <sup>-10</sup> max. over -20°C to +65°C	a) Standard option: -20°C to +74°C (base plate) with degradation above 71°C. b) -40°C to +77°C (base plate), contact factory. c) ±5x10 <sup>-11</sup> / -20°C to +71°C, contact factory
<b>Storage Temp:</b>	-40°C to +80°C	
<b>Frequency Adjust:</b>	Mechanical: ±3x10 <sup>-9</sup> Trimmer 10 turns.	Electrical: ±1.5x10 <sup>-9</sup> min/ 0 to 10VDC
		Digital: <1x10 <sup>-12</sup> steps / >1x10 <sup>-6</sup> range Included in this option: Software for PC
<b>Connectors:</b>	D-Type Subminiature 9 pins (male): see below SMA: 10MHz	
<b>Dimensions:</b>	77 x 77 x 39.6 mm	
<b>Weight:</b>	360g max.	
<b>Magnetic Field Sensitivity:</b>	<5x10 <sup>-11</sup> /gauss worst axis	
<b>Vibrations:</b>	Random: 3.0grms, 20 to 500Hz (with some degradation in performance)	5.7grms, 10 min per axis (Contact factory for details)
<b>Shock:</b>	20g half sine, 11ms, momentary offset <1x10 <sup>-9</sup>	
<b>Hold-Over Mode:</b>	If lock is lost, the internal OCXO continues to provide an output frequency with the last saved frequency and with the very good stability of an OCXO.	
<b>Reliability:</b>	>1,400,000 hrs @ 25°C, G.B. , >108,000 hrs @ 60°C, G.B. per MIL HDBK-217F	
<b>Accuracy at Shipment:</b>	5x10 <sup>-11</sup>	
<b>Built In Test (Bit)</b>	Detects > 97% of all failures. "1"=High Impedance=Unlock / "0"=Short to Ground=Ok (Lock)	

(\*) All specs are at room temperature quiescent conditions, unless otherwise specified

(\*\*) Some combinations of options are not available

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